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RESPIRATORY PARALYSIS FROM HÆMORRHAGE AROUND THE MEDULLA.

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Through the kindness of my friend, Dr. J. N. Hall, I am able to report this most interesting case, and have added other cases of the same character, but brought about by different causes.

Mrs. X., aged 27, well developed and rather fat, was pregnant, and exactly ten calendar months after her last menstruation and five months and twelve days after feeling motion, began to be in labor. At the end of twenty-four hours, moderate dilatation of the os had occurred. Position of head, O. D. P. After repeated 15-grain doses of chloral were administered, the last dose accompanied with one-eighth grain of morphine sulphate, dilatation of the os to the extent of three inches occurred. This amount of dilatation was reached after the patient had been in labor for thirty-two hours. At this time, in consultation with Dr. T. E. Taylor, it was determined by measurement that the pelvis was of natural size and, under chloroform, forceps were applied (high operation) and extraction made. Child, female, about seven and one-half pounds in weight, and well developed. Heart beat vigorously, but there was no sign of a respiratory movement. All artificial means known to stimulate respiratory action were employed without success; nevertheless the heart continued to beat for fifty minutes, when we made traction on the tongue, and the child breathed for twenty minutes, after which this method lost its effect and the mouth

to mouth method was used, but the heart gradually failed, and the child died two and a half hours after birth.

An autopsy was held twenty-four hours after death. The external surface was normal, excepting a few bruises upon the head, superficial, and caused by the forceps. Examination of the brain showed that a hæmorrhage had occurred around the medulla, due to rupture of the anterior spinal artery, a branch of the vertebral. Nothing abnormal could be found in any other portion of the brain.

Dr. J. T. Eskridge[1] reports a case of tumor and large cyst of the cerebellum, with symptoms extending over several years.

The patient was eleven years old, and suffered from spastic seizures, with all the classical symptoms of tumor of the brain. The day that she died the patient developed Cheyne Stokes respiration, and at two p. m. respiratory action ceased, but the heart continued for several minutes while artificial respiration was employed.

Hughlings Jackson[2] reports a case of cyst of the cerebellum; weakness of spinal muscles; death from failure of respiration. The patient was a male, thirty years old, who suffered from symptoms of an intracranial lesion, from 1889 to February 13, 1890. The day previous to his death he suffered from a severe headache, with occasional vomiting, and at six p. m. he suddenly became unconscious and his breathing ceased, though his pulse continued fairly good. Artificial respiration was commenced at once and continued until 2:30 next morning, when the heart stopped beating. During the eight hours and a half that artificial respiration was continued, there was no sign of natural breathing.

J. F. Atkins[3] reports the following interesting case of tumor of the cerebellum: "J. B., aged 42. One evening I was callled to see him in the ward, and found him in a state of coma. A few minutes later he stopped breathing, but his heart was still beating (140 per minute). Artificial respiration was at once commenced and continued for three hours and a quarter. At the expiration of this time he commenced breathing naturally, and it was no longer necessary to perform artificial respiration. A few days later he was as well as before the onset of the coma, and was able to walk with assistance. He died eight weeks afterward from asthenia, and the cerebellar tumor was verified at the post mortem.

We not only find these phenomena present in the above class of cases, but they are observed in shock, this fact having been pointed out by J. F. Kramer[4]. He says that death due to syncope is produced

1. *Medical News, August 17, 1895.*
2. *British Med Journal, F . , 1894.*
3. *British Med. Journal, Mar. 31, 1894.*
4. *Boston Med. and Surg. Journal, Dec. 3, 1896.*

by paralysis of the respiratory centers, the cardiac centers remaining intact.

This strange condition can be explained by a study of the anatomy and physiology of the nervous mechanism of respiration, and of the cardiac action. In the first place, we know that the respiratory centers are situated in the floor of the fourth ventricle, at the upper and back part of the medulla. As to the cardio-inhibitory centers, we do not know the exact position of them, but they are in close proximity to the former. The pneumogastric nuclei are situated in the medulla, and from them fibres run to the respiratory and cardio-inhibitory centers; therefore the function of the vagi is two-fold; first, to regulate the respiratory action, and, secondly, to inhibit the heart's action. Experimental physiology has proven this fact, that if we make a section of the pneumogastric nerves, we will not have complete failure of respiration, but it produces a marked change in respiratory movement, in that each breath becomes deeper and more prolonged than normal, while the rate of respiration is reduced about one-half. This can be explained by the fact that the respiratory centers are both reflex and automatic.

The pneumogastric nerves form a large portion of the supply of nerves to the heart and, as stated, the function is to regulate the heart's action by communicating with the cardio-inhibitory center in the medulla. The heart not only receives its nerve supply from the pneumogastric nerve, for it has been proven by the experiments of Gaskill[5] and others, that the fifth, the sixth, the seventh and the eighth cervical, and the first, but principally the second, dorsal nerves pass to the cervical sympathetic ganglia, and hence, by the cardiac splanchnic, to the heart. When these nerves are affected by inflammation, as they are in some cases of ascending neuritis, we will have sudden death due to failure of the heart's action. On the other hand, if we stimulate the pneumogastric nerves with an electrical current we at once cause a stoppage of the heart's action for a short time, whereas, if we make complete section of these nerves it will cause an increase in the rapidity of the heart's action. The most interesting physiological experiment known of in this connection is the following: [6]If we injure or destroy the medulla, we cause instant death; but if the portion of the medulla between the calamus scriptorius and the vasomotor center be destroyed, respiration ceases, although the heart's action is undisturbed. We cannot positively prove why this takes place, but we surmise that in this space the fibres which run from the pneumogastric nuclei to the respiratory center have their course.

In studying these cases it is a difficult task to come to a definite

5. *Medical News, Jan. 6, 1896, page 1.*
6. *Foster's Physiology, page 250.*

conclusion as to the exact causes and structures involved, producing this strange condition. I am of the opinion that, in the first case, the disturbance of respiration was caused by direct pressure upon the respiratory center, over the portion of the medulla between the calamus scriptorius and the vaso-motor centers, for if the pneumogastric nuclei were infringed upon we would have the cardiac action involved, in conjunction with respiration. This naturally leads up to another question: Why is it that respiration is affected and the hearts action unimpaired when the centers are situated so close together?

In the first place, the fibres which run to the respiratory center occupy this space, and, secondly, the cardio inhibitory centers must be much more resistant than the former. This view would not only hold good in the case of hæmorrhage, but also in tumors of the cerebellum, where they produce pressure on the medulla.

Buzzard has suggested that in tumors of the cerebellum which have caused failure of respiration, where the heart continued to beat, that it is due to the fact that the same changes take place in the respiratory centers that are found in the optic nerves in this class of cases. But if this be true we would have respiration gradually failing, and not suddenly, as in the above cases. The only explanation one can give for these phenomena occurring in shock is that the respiratory apparatus is less resistant than other portions of the nervous system, especially the cardio-inhibitory apparatus.